(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 January 2005 (27.01.2005)

PCT

(10) International Publication Number
WO 2005/008816 A2

(51) International Patent Classification[7]: H01M 8/00

(21) International Application Number: PCT/CA2004/001044

(22) International Filing Date: 15 July 2004 (15.07.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/604,413 18 July 2003 (18.07.2003) US

(71) Applicant *(for all designated States except US)*: **FUEL-CELL ENERGY, LTD.** [CA/CA]; 4908 - 52 Street S.E., Calgary, Alberta T2B 3R2 (CA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **ZHANG, Xinge** [CA/CA]; c/o 4908 - 52 Street S.E., Calgary, Alberta T2B 3R2 (CA). **WOOD, Anthony** [GB/CA]; c/o 4908 - 52 Street S.E., Calgary, Alberta T2B 3R2 (CA). **RIOU, Michel** [CA/CA]; c/o 4908 - 52 Street S.E., Calgary, Alberta T2B 3R2 (CA).

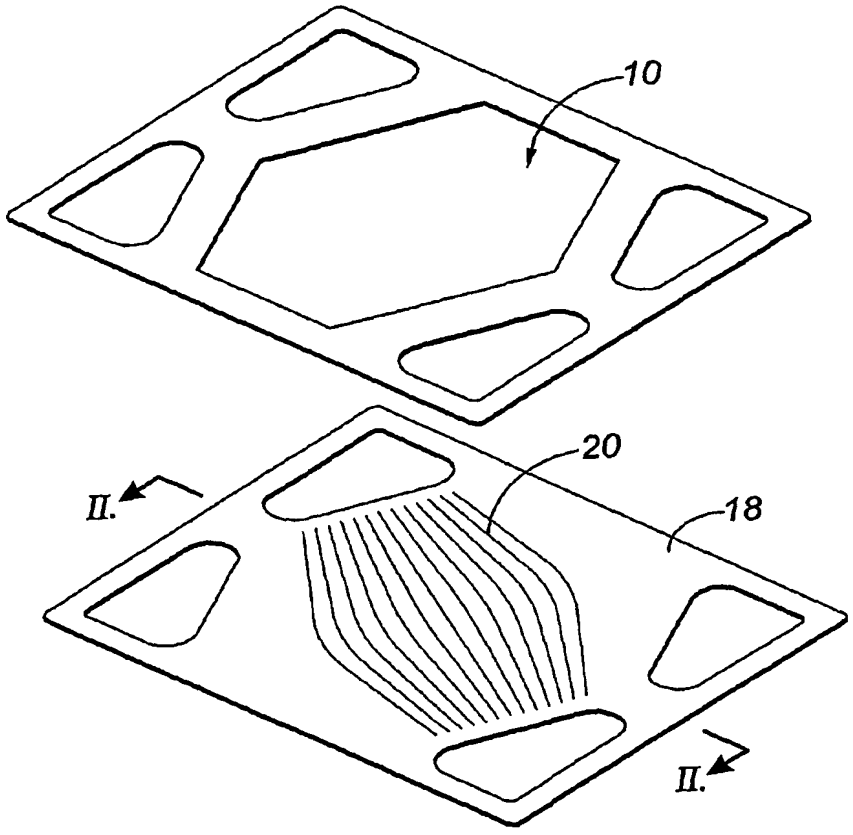
(74) Agent: **BENNETT JONES LLP**; 1000 ATCO Centre, 10035 - 105 Street, Edmonton, Alberta T5J 3T2 (CA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH,

*[Continued on next page]*

(54) Title: ELECTRICALLY CONDUCTIVE FUEL CELL CONTACT MATERIAL




(57) Abstract: A multilayer contact approach for use in a planar solid oxide fuel cell stack includes at least 3 layers of an electrically conductive perovskite which has a coefficient of thermal expansion closely matching the fuel cell material. The perovskite material may comprise $La_{1-x}$ $E_x$ $Co_{0.6}Ni_{0.4}O_3$ where E is a alkaline earth metal and x is greater than or equal to zero. The middle layer is a stress relief layer which may fracture during thermal cycling to relieve stress, but remains conductive and prevents mechanical damage of more critical interfaces.

WO 2005/008816 A2

GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— *without international search report and to be republished upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

PCT

(43) International Publication Date
27 January 2005 (27.01.2005)

(10) International Publication Number
WO 2005/008816 A3

(51) International Patent Classification[7]: H01M 8/02

(21) International Application Number:
PCT/CA2004/001044

(22) International Filing Date: 15 July 2004 (15.07.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/604,413 18 July 2003 (18.07.2003) US

(71) Applicant *(for all designated States except US)*: **VERSA POWER SYSTEMS, LTD.** [CA/CA]; 4852 - 52 Street, S.E., Calgary, Alberta T2B 3R2 (CA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **ZHANG, Xinge** [CA/CA]; c/o 4908 - 52 Street S.E., Calgary, Alberta T2B 3R2 (CA). **WOOD, Anthony** [GB/CA]; c/o 4908 - 52 Street S.E., Calgary, Alberta T2B 3R2 (CA). **RIOU, Michel** [CA/CA]; c/o 4908 - 52 Street S.E., Calgary, Alberta T2B 3R2 (CA).

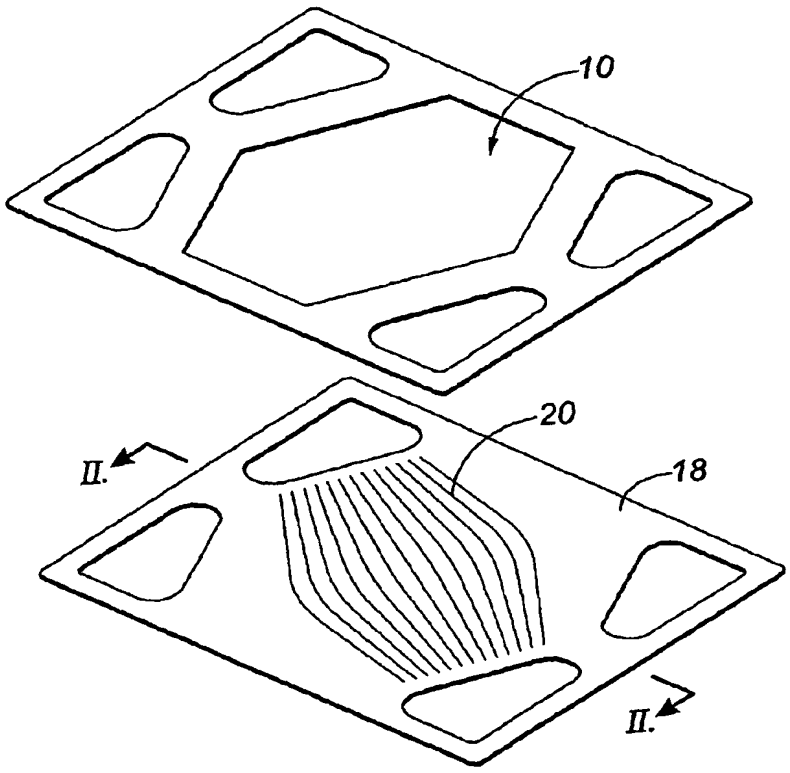
(74) Agent: **BENNETT JONES LLP**; 1000 ATCO Centre, 10035 - 105 Street, Edmonton, Alberta T5J 3T2 (CA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, **BR**, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, **HR**, HU, **ID**, IL, IN, IS, **JP**, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, **BJ**, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*[Continued on next page]*

(54) Title: ELECTRICALLY CONDUCTIVE FUEL CELL CONTACT MATERIAL




(57) Abstract: A multilayer contact approach for use in a planar solid oxide fuel cell stack includes at least 3 layers of an electrically conductive perovskite which has a coefficient of thermal expansion closely matching the fuel cell material. The perovskite material may comprise $La_{1-x}E_xCo_{0.6}Ni_{0.4}O_3$ where E is a alkaline earth metal and x is greater than or equal to zero. The middle layer is a stress relief layer which may fracture during thermal cycling to relieve stress, but remains conductive and prevents mechanical damage of more critical interfaces. A fuel cell stack is also disclosed, which comprises a plurality of planar interleaved fuel cells and interconnects comprising a contact layer disposed between at least one electrode of a fuel cell and an adjacent interconnect, the contact layer comprising a perovskite having the formula ABO<sb>3 where: (a) A is a doped or undoped rare earth metal or lanthanide; (b) B is a doped or undoped transition metal; and (c) wherein the perovskite is a electrically conductive and has a coefficient of thermal expansion which closely matches that of the fuel cell.

WO 2005/008816 A3

**Published:**
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the international search report:**
26 January 2006

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*